

## One Health for neglected tropical diseases

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The forthcoming World Health Organization road map for neglected tropical diseases (NTDs) 2021–2030 recognises the complexity surrounding control and elimination of these 20 diseases of poverty. It emphasises the need for a paradigm shift from disease-specific interventions to holistic cross-cutting approaches coordinating with adjacent disciplines. The One Health approach exemplifies this shift, extending beyond a conventional model of zoonotic disease control to consider the interactions of human and animal health systems within their shared environment and the wider social and economic context. This approach can also promote sustainability and resilience within these systems. To achieve the global ambition on NTD elimination and control, political will, along with contextualised innovative scientific strategies, is required.

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Recognition of the interconnected nature of human health within whole ecosystems is not a new concept, being highlighted as early as the 1880s by Dr Rudolf Virchow. By the late 20th century however, rapid advancement in medical knowledge led to increasingly specialised disciplines and clinical practice and to more siloed approaches to planning and budgeting of human, animal and environmental health interventions.

More recently an integrated approach to health across disciplines and sectors has received renewed interest and formal high-level recognition with the establishment in 2010 of the tripartite collaboration agreement between the World Health Organization (WHO), World Organisation for Animal Health (OIE) and the Food and Agriculture Organization (FAO) to ‘address health risks at the animal–human–ecosystems interface’.<sup>1</sup> There are also regional models fostering human and animal health interactions and governance at the country level, such as the Inter-American Ministerial Meeting on Health and Agriculture, first established in 1968.<sup>2</sup> Despite this increasing uptake of One Health, the One Health evidence base reveals a dominance of human health outcomes over those for animal and environmental sectors. A recent edi-

torial in The Lancet further recognised the need for a broader range of stakeholders and perspectives to be considered in a One Health approach,<sup>3</sup> including economics and equity, cultural context, livelihoods, political context and global trends such as globalisation, urbanisation, deforestation, population increase and displacement and climate change.

A catalyst for focusing on the animal–human–environmental interface within the neglected tropical disease (NTD) community has been a growing recognition of the importance of animal and environmental controls in the epidemiology and control of many NTDs, including rabies and parasitic food-borne zoonoses. The forthcoming WHO NTD road map 2021–2030 establishes the need for a One Health approach to achieve its ambitious disease-specific control and elimination targets while acknowledging the broader systems benefits of collaboration and the need to assess the unintended consequences from interventions on adjacent sectors. Additionally, with livestock contributing to >70% of rural livelihoods globally and often representing a family’s major asset, controlling zoonotic NTDs using a One Health approach is an important tool for human and economic development.

The road map notes ‘experience from the past decade shows that further multisectoral action is required, particularly in diagnostics, monitoring and evaluation, access and logistics, and advocacy and funding’. It also recommends the use of a One Health approach for disease surveillance, programme planning, education and behaviour change and the potential of improving animal health services for zoonotic NTD control.

Multisector surveillance and diagnostic strategies can be especially useful in resource-poor settings to improve detection where zoonotic animal diseases can spill over into human populations—as shown by the frequent misdiagnosis of human febrile illness such as malaria in hospitalised patients in Tanzania, where 26% of cases were actually due to bacterial zoonoses compared with 1.6% due to malaria.<sup>4</sup> Furthermore, the importance of considering interactions between livestock, humans and pathogens in their shared environment is highlighted by the emergence of hybrid bovine and human schistosomes.<sup>5</sup> Most recently, the need for early identification of emergent or potentially emergent zoonotic pathogens through multisector approaches as a cause of major disease outbreaks has been highlighted by the global coronavirus disease 2019 pandemic.

Cost-effective monitoring and evaluation of intervention impacts has long been a pillar of NTD programmes such as human deworming; however, this has been largely confined to human health impacts, without also measuring impacts on animal populations or environmental aspects that can result in unexpected outcomes. As has been the case with Guinea worm re-emergence where, after getting close to eradicating this disease, Chad has seen a significant increase in new cases after 10 years due to an animal reservoir of parasites in dogs.<sup>6</sup> Certifying the eradication of Guinea worm in humans will only be possible with the establishment of robust surveillance measures in animals alongside human populations.

Accessing hard-to-reach populations will be a key challenge in achieving the road map’s elimination and eradication targets alongside the health-related Sustainable Development Goal targets. Utilising the reach of veterinary public health services in some contexts has been beneficial, especially in pastoralist communities. Studies conducted in Chad<sup>7</sup> found increased uptake from simultaneous vaccination programmes targeting both livestock and children and additionally distributed vitamin A to counteract high levels of deficiency and risk of blindness.<sup>8</sup> Sharing of logistics costs (i.e. personnel, transportation and cold chain costs) between the medical and veterinary services in Chad was also shown to reduce the total costs of mounting vaccination campaigns separately by up to 15%. In Tanzania, integrated delivery of human anthelmintic treatments through dog rabies control programmes proved to be popular as well as cost- and time-saving, also managing to reach children not enrolled in school who otherwise might be missed by school-based delivery strategies.<sup>9</sup>

A barrier to realising the benefits offered by multisectoral approaches is often a lack of appropriately targeted advocacy and funding models and a lack of shared indicators relevant to all sectors. Echinococcosis, for example, is an NTD for which reducing negative impacts in humans is a priority, but effective disease control can be targeted at dogs and human behaviours. Ministries of health wanting to reduce human disease may find it challenging to mobilise their resources for animal-based control

measures, as might also be the case with private funding structures.<sup>10</sup> However, having appropriate joint indicators and appropriate coordination and funding models has been shown to overcome some of these challenges—for example, in Latin America, where canine rabies control responsibilities have been brought under the remit of ministries of health,<sup>11</sup> and multisector international working groups have been created to tackle this disease on a global level.

As we plan for the next decade of progress on NTDs, it is important to recognise the resources and time scale needed to meet the road map’s ambitious targets by 2030. Success will require innovative approaches that draw links between health, agriculture and development actions in a way that supports the achievement of multiple targets in a cost-effective way and, with benefits across all sectors, to achieve sustainable progress. Since NTD transmission is influenced directly and indirectly by socio-cultural, economic, anthropological and ecological factors, a One Health approach is essential to target all these elements and provides a framework for collaboration between healthcare services, veterinary public health services and environmental protection programmes, including safe water and basic sanitation.

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## References

- 1 FAO–OIE–WHO Collaboration. Sharing responsibilities and coordinating global activities to address health risks at the animal-human-ecosystems interfaces. A tripartite concept note. Available from: [https://www.who.int/foodsafety/zoonoses/final\\_concept\\_note\\_Hanoi.pdf?ua=1](https://www.who.int/foodsafety/zoonoses/final_concept_note_Hanoi.pdf?ua=1) [accessed 6 August 2020].
- 2 RIMSA-PAHO/WHO. 17th Inter American Ministerial Meeting on Health and Agriculture: “One Health and the Sustainable Development Goals”. RIMSA 17 recommendations. Available from: [http://www.panaftosa.org/rimsa17/dmdocuments/Recomendaciones\\_RIMSA17\\_\[280716\]\\_english.pdf](http://www.panaftosa.org/rimsa17/dmdocuments/Recomendaciones_RIMSA17_[280716]_english.pdf) [accessed 6 August 2020].
- 3 Zoonoses: beyond the human–animal–environment interface. *Lancet* 2020;396(10243):1.
- 4 Crump JA, Morrissey AB, Nicholson WL, et al. Etiology of severe non-malaria febrile illness in northern Tanzania: a prospective cohort study. *PLoS Negl Trop Dis.* 2013;7(7):e2324.
- 5 King KC, Stelkens RB, Webster JP, et al. Hybridization in parasites: consequences for adaptive evolution, pathogenesis, and public health in a changing world. *PLoS Pathogens.* 2015;11(9):e1005098.

- 6 Renewed transmission of dracunculiasis—Chad, 2010. *MMWR Morb Mortal Wkly Rep.* 2011;60(22):744–8.
- 7 Bechir M, Schelling E, Wyss K, et al. [An innovative approach combining human and animal vaccination campaigns in nomadic settings of Chad: experiences and costs]. *Med Trop (Mars).* 2004;64(5):497–502.
- 8 Zinsstag J, Schelling E, Daoud S, et al. Serum retinol of Chadian nomadic pastoralist women in relation to their livestock's milk retinol and beta-carotene content. *Int J Vitam Nutr Res.* 2002;72(4): 221–8.
- 9 Lanketser F, Davis A, Kinung'hi S, et al. An integrated health delivery platform, targeting soil-transmitted helminths (STH) and canine mediated human rabies, results in cost savings and increased breadth of treatment for STH in remote communities in Tanzania. *BMC Public Health.* 2019;19(1):1398.
- 10 Pavletic CF, Larrieu E, Guarnera EA, et al. Cystic echinococcosis in South America: a call for action. *Rev Panam Salud Publica.* 2017;41:e42.
- 11 Vigilato MAN, Molina-Flores B, Del Rio Vilas VJ, et al. Canine rabies elimination: governance principles. *Rev Sci Tech.* 2018;37(2):703–9.